Case Report - Dr. med. dent. Urs Brodbeck, Switzerland

Digital Workflow: Manufacturing of a Screw-Retained Monolithic Zirconia Implant Bridge

Urs Brodbeck, Mark Kabashi, Roland Kiss

Introduction

Today it is possible to manufacture a complete maxillary bridge on implants without impressions and physical models. After the implants have successfully osseointegrated, a temporary bridge was milled out of PMMA. To produce the final restoration, an intraoral scanner (Trios®, 3Shape, Copenhagen/ Denmark) is used to create a new digital record. At first, scan-bodies (Biodenta, Switzerland) are screwed on the five implants. Afterwards, upper and lower arch are scanned. Nowadays, it only takes about 30 seconds to get the impression for one arch. Finally, the half-arch temporary restoration is used on only one side and the bite on the non-toothed side is registered digitally (duration10 seconds). The software aligns upper and lower arch in the correct position. The articulated bridge is prepared and designed in 3Shape CAD software by the dental laboratory. Today, the monolithic zirconia has been proven in these cases to be a viable option. By partial intraoral cementing of individual abutments, the bridge is largely free of tension and with this approach any cement residues are ideally removed.

Case Report

This 82 year-old patient wishes to have a fixed full-arch maxillary restoration (Fig. 1).

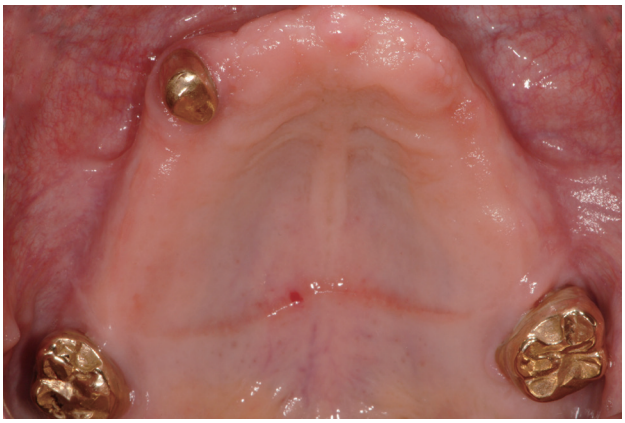

Fig. 1

Five implants (Biodenta®, Switzerland) were successfully placed in a two-stages approach with simultaneous sinus lifts. In the maxilla, one 4.1mm x 8mm was placed in position #15, four 4.1mm x 10mm were placed in position #12, #14, #22, #24. All implants placed are Biodenta® Bone Level Tapered (Fig. 2).

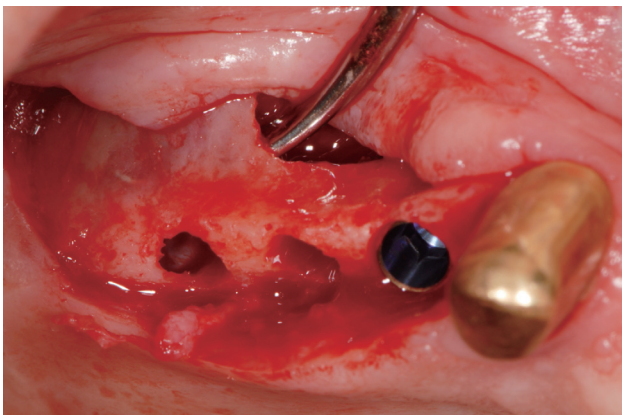

Fig. 2

In order to take the digital impression, the scan bodies are seated and hand-tightened on the five implants. With the digital impression, the exact implant position, angulation and rotation are captured in the digital record (Fig. 3).

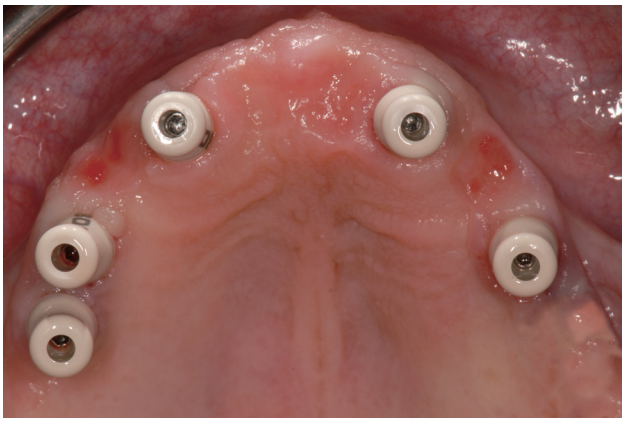

Fig. 3

Previously, a temporary solution was provided to the patient. However, the resin bridge broke and had to be repaired several times. Hence, a monolithic zirconia bridge is the better choice for the treatment since the bridge withstands high masticatory force.

In order to register the bite, the temporary bridge is split between the two central incisors (Fig. 4). One part of the temporary is inserted in the patient's mouth so that the other side can be scanned maximum inter-cuspidation. The software then aligns upper and lower jaw in the correct position (Fig. 5).

Fig. 4

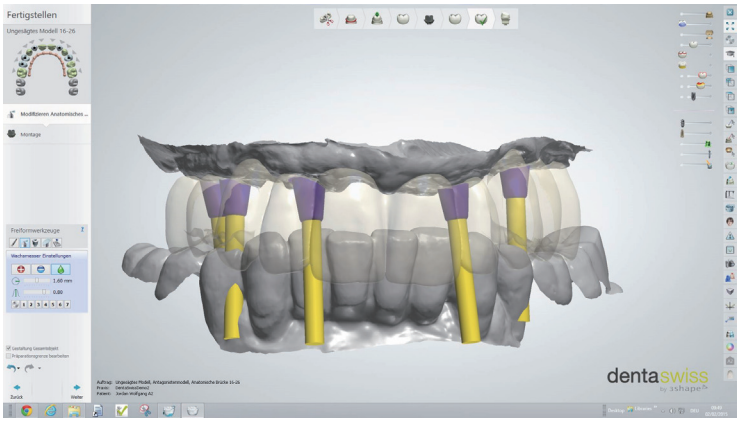

Fig. 5

The scanned temporary prosthesis is further used for the design of the final restoration. The bridge is designed according to the specified implant position with the ideal contour, occlusion and articulation. The design is then milled from zirconia with a five-axis CAD/CAM milling machine. The color modification of the zirconia is achieved by pigment infiltration and surface staining. Figure 6 and 7 show the monolithic zirconia bridge before and after sintering.

Fig. 6

Fig. 7

The multi-use abutments (Biodenta®, Switzerland) are seated and tightened on the five implants by using the driver with a torque of 35Ncm. Composite cement is used to fix the conical sleeves in the zirconia bridge. Only three sleeves should be cemented in the laboratory. The remaining two sleeves are bonded intra-orally in order to obtain a tension free restoration on the implants (Fig. 8).

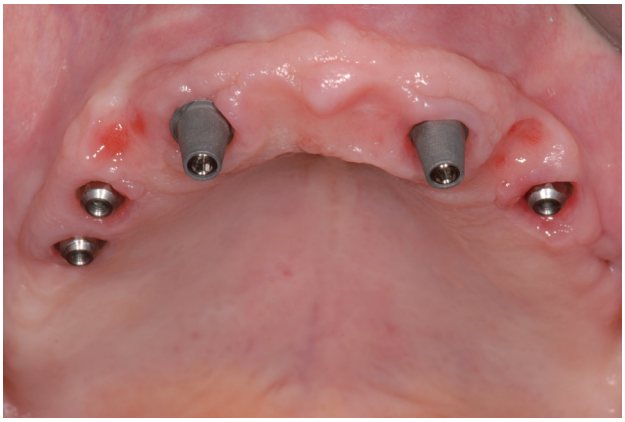

Fig. 8

To avoid composite cement flow into the screw holes, the holes are sealed with Teflon (Fig. 9). The sleeves and the zirconia bridge were sandblasted and treated with a phosphate monomer (Monobond plus®) prior to cementation.

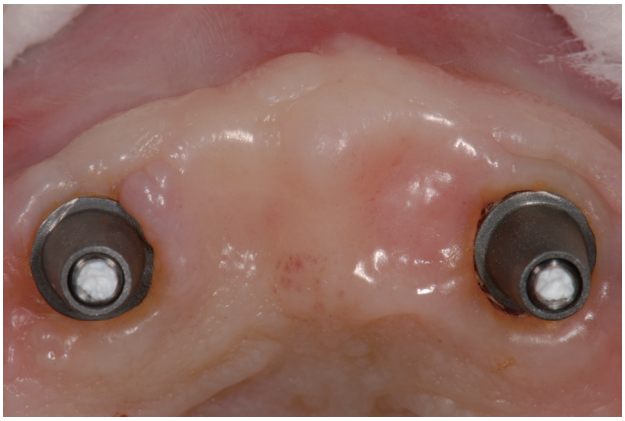

Fig. 9

Once the screws are tightened with the already bonded implants, excess of cement is removed from the screw holes (Fig. 10). Excess cement can be easily removed extra-orally after removing the bridge. It is also possible to optimally complement all cement joints and polish the denture (Fig. 11).

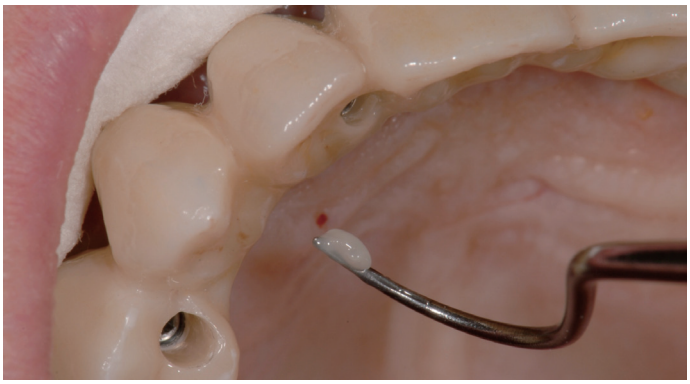

Fig. 10

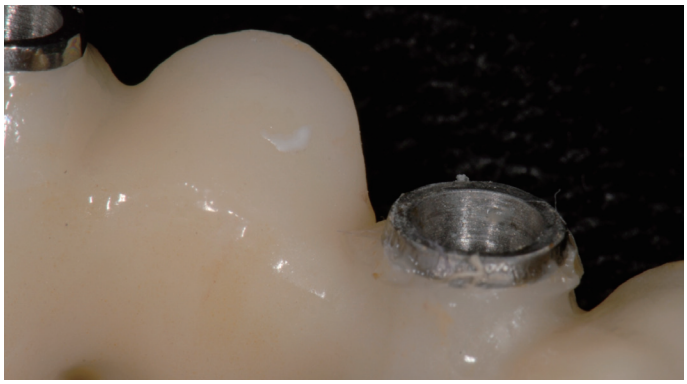

Fig. 11

The finished zirconia bridge is screwed back into patient's mouth by using the driver with a torque of 20Ncm. In the end, occlusal relationships are checked, and resiliency and hinge axis movement are confirmed.

The radiograph shows the seated final restoration (Fig. 12).

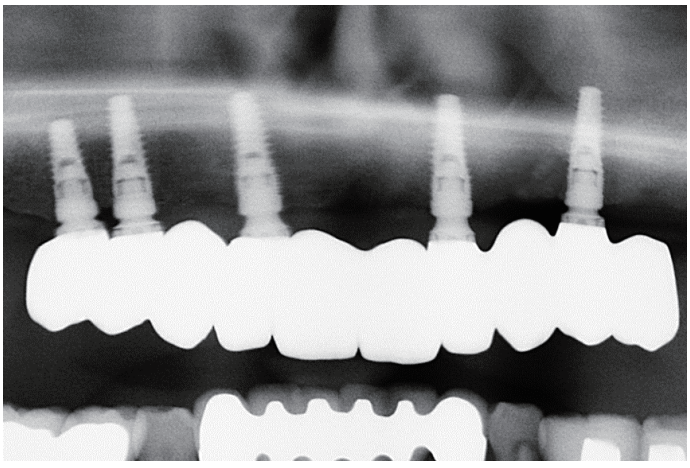

Fig. 12

The photo shows the satisfied patient with the finished work (Fig. 13). Even without layered porcelain, a pleasing appearance can be achieved with highly stable monolithic zirconia.

Fig. 13

Clinician:
Dr. Urs Brodbeck

Lab Technicians:
Mark Kabashi
Roland Kiss